Canned Fish Bites in Tomato Sauce

CENTRAL FOOD TECHNOLOGICAL RESEARCH INSTITUTE
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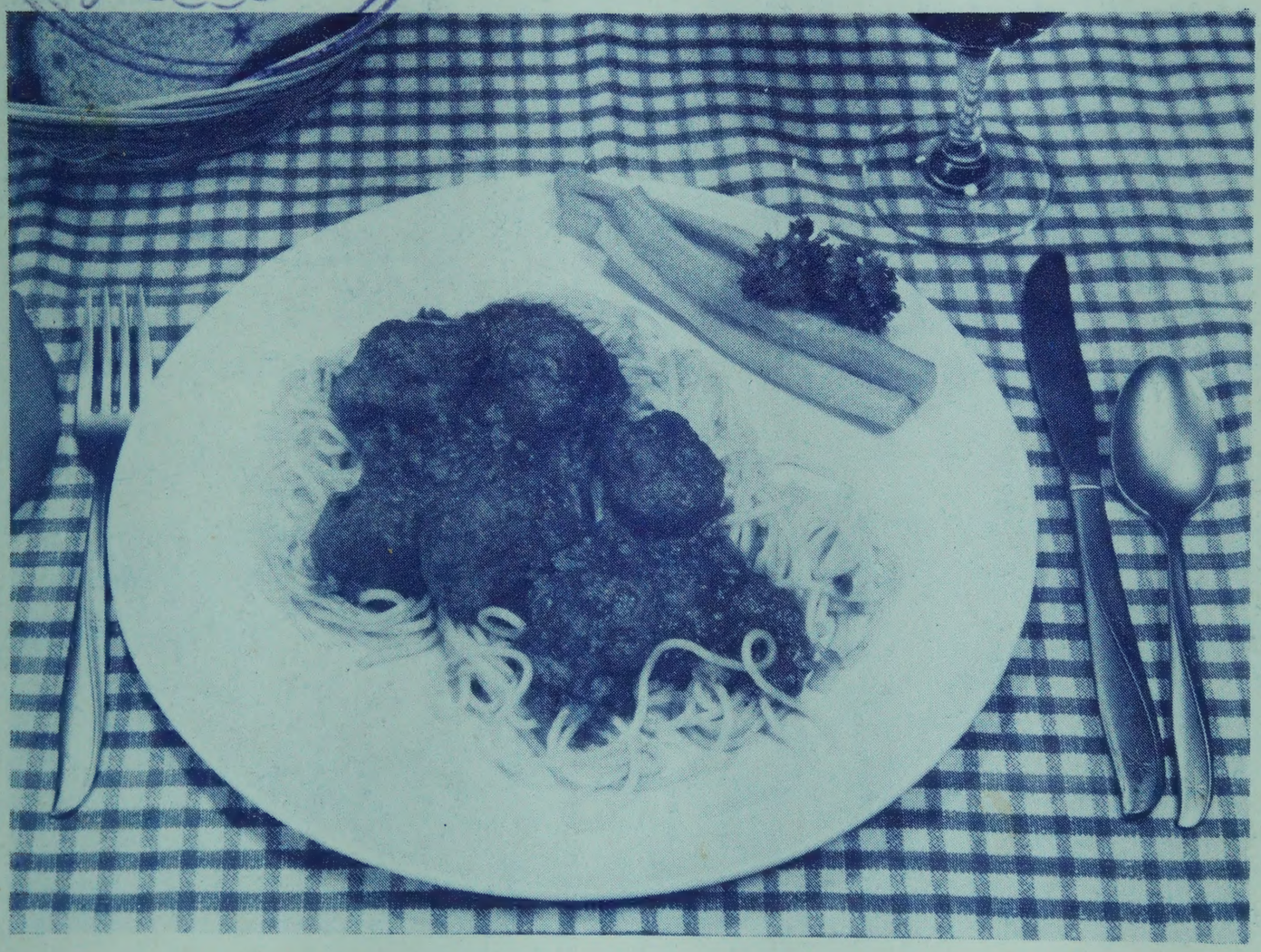
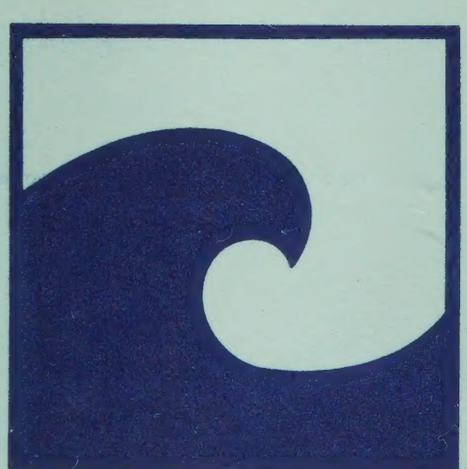


Development of Products from Minced Fish: Booklet 7



This is one in a series of booklets on minced fish products written for people in the food processing industry.

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DEVELOPMENT OF PRODUCTS FROM MINCED FISH

7. CANNED FISH BITES IN TOMATO SAUCE

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ABSTRACT

Meatballs in tomato sauce are a popular and accepted canned convenience product. Since small bite-sized portions of a fish mixture in a creamy sauce had been found to be an acceptable product (Creamy Fish Bites), the authors developed a canned fish bite in tomato sauce. Several species of fish and several combinations of fish with meats were compared with fish bites made from minced white sucker.

DEVELOPMENT OF PRODUCTS FROM MINCED FISH:

7. CANNED FISH BITES IN TOMATO SAUCE

INTRODUCTION

Previous work in this laboratory on products made from mechanically deboned white sucker (Catostomus commersoni) showed that this fish product can be made into very acceptable bite-sized "meatballs" (Baker et al. 1977). One of the more popular "meatball" products in the United States is meatballs in tomato sauce, which is available in cans and usually is served over spaghetti. In this project we investigated making this type of food with minced fish as the main ingredient.

TESTING PROCEDURES

Materials

The product was developed using deboned white sucker (Catostomus commersoni), called mullet in Canada and parts of the United States. The fish was commercially headed and gutted, washed, run through a belt-type deboning machine, and frozen. This laboratory received the product in polyethylene bags and stored it in a walk-in freezer at -25°C (-11°F) until use. In one study, we compared several other species of fish with the sucker. Other ingredients were obtained either from suppliers to the food industry or from a local supermarket.

Taste Paneling

A trained eight-member taste panel--male and female faculty members, technicians, and housewives--evaluated the products. The score sheet used a semistructured scale from 9 to 1, where 9 denoted the most desirable attributes, except tenderness and juiciness, where a score of 5 denoted optimum or "just right." Figure 1 shows a sample score sheet. Occasionally a modified triangle test score sheet was used which asked the judges to identify the odd sample, tell on what factor(s) they based their decision, and indicate preference for the pair or for the odd sample (Figure 2).

FIGURE 1. SCORE SHEET USED FOR TASTE PANELING

NAME: _____

DATE: _____

PRODUCT: Fish Bites in Tomato Sauce

	X	#	S	=	V
Acceptability of texture of meatballs					
9 8 7 6 5 4 3 2 1					
excellent poor					
Tenderness of meatballs					
9 8 7 6 5 4 3 2 1					
too tender, mushy — just right — too tough					
Juiciness of meatballs					
9 8 7 6 5 4 3 2 1					
too juicy — just right — too dry					
Flavor					
9 8 7 6 5 4 3 2 1					
excellent poor					
Overall desirability					
9 8 7 6 5 4 3 2 1					
excellent poor					

COMMENTS:

FIGURE 2. SCORE SHEET FOR THE MODIFIED TRIANGLE TEST

NAME: _____

DATE: _____

PRODUCT: _____

You will be given three samples to taste. Two of the samples are the same and one is different. Please circle the symbol indicating the one sample in the group that is different.

	X	O	V
Circle one:	_____	_____	_____

On what did you base your decision?

Flavor _____

Tenderness _____

Juiciness _____

Other (name) _____

Which sample(s) do you prefer?

Odd sample _____

Pair _____

Shear Press Determinations

The Shear Press was used to determine the amount of force required to cut through the fish bites. We used the standard shear cell, which consists of a container with a slotted bottom and cover, and a set of blades fitting through the slots. The maximum force value which is recorded is

roughly equivalent to the tenderness of the fish bites, as perceived with your first bite.

Shear values were obtained as follows: Rolling the fish bites in paper towels removed the sauce. Then each fish bite was trimmed to a constant weight of 8 $\pm$ 0.05 grams. Three fish bites inserted into the standard shear cell of an Allo-Kramer Shear Press were sheared, using a 20-second downstroke and the two percent range of a 2500-pound proving ring (or 50 lb. full scale). Maximum force values were calculated as pounds of force per gram required to shear the samples.

DEVELOPMENT OF THE PRODUCT

All experimental batches used the tomato sauce made from the formula in Table 1.

TABLE 1. FORMULA FOR TOMATO SAUCE

Ingredients	Pounds	Ounces
Tomato paste	4	0
Sugar		3.00
Tapioca starch (retortable)*		2.50
Salt		2.50
Garlic powder		0.20
Onion powder		0.12
Oregano		0.10
Basil		0.06
Water		to 2 gallons

*Starch: #3435, Stein Hall Co., Inc.

Based on previous experience with small bite-sized shapes of fish (Baker et al. 1977), several formulas were made up which the taste panel tested for acceptability of texture. Shear values also were measured. The formulas and test results are in Table 2. As shown, formula D produced a very acceptable texture. Its shear values were higher than those of the other formulas, indicating that the panel preferred the firmest product. In fact, texture scores and shear values showed an almost perfect correlation.

TABLE 2. EFFECT OF INGREDIENTS ON TEXTURE AND SHEAR VALUES OF FISH BITES IN TOMATO SAUCE

	Batch Code				
Ingredients[1]	A %	B %	C %	D %	E %
Minced fish	83.0	83.0	81.0	83.0	78.0
Egg	2.0	0.0	0.0	0.0	0.0
TSP[2]	4.0	4.0	4.0	6.0	6.0
SPF[3]	4.0	4.0	6.0	4.0	4.0
Starch[4]	0.0	2.0	2.0	0.0	0.0
Vegetable oil	0.0	0.0	0.0	0.0	5.0
Evaluation					
Acceptability of texture scores	6.0	5.0	5.8	7.7	7.0
Overall desirability	5.6	6.2	6.0	7.2	6.8
Shear values (lb/gm)	1.8	1.3	1.6	2.7	2.3

[1] Remaining ingredients include dry bread crumbs (Arnold Bakers), 4%: dehydrated onions, 1.0%; salt, 1.0%; MSG, 0.3%; dehydrated parsley, 0.3%; Italian seasoning blend, 0.2%; powdered garlic, 0.1%; and pepper, 0.1%.

[2] TSP: Textured soy protein (Promate 111, Griffith Labs.).

[3] SPF: Fibrous soy protein (SPF 200, Ralcon Foods).

[4] Starch: #3435 (Stein Hall Co., Inc.).

Since the acceptability of most foods depends to a great extent on the flavor, several seasoning blends were evaluated relative to formula D. Table 3 shows seasoning ingredients and the flavor scores. As can be seen, formula K seasoning was the most acceptable to the panel that evaluated these samples. Seasoning of any product, however, is a personal choice but these results provide guidelines. The type and proportion of seasonings should depend on the preferences of the probable consumers of the product.

TABLE 3. EFFECT OF SEVERAL SEASONING BLENDS ON THE FLAVOR OF FISH BITES IN TOMATO SAUCE

Ingredients[1]	Batch Code				
	F	G	H	I	K
	%	%	%	%	%
Parsley (dehydrated)	0.3	0.2	0.3	0.30	0.3
Garlic (powdered)	0.1	0.1	0.1	0.14	0.1
Italian seasoning blend[2]	0.2	0.2	0.0	0.00	0.0
Onions (dehydrated)	1.0	1.0	1.0	1.40	1.4
Basil	0.0	0.0	0.1	0.06	0.1
Oregano	0.0	0.0	0.2	0.14	0.2
Flavor scores	4.5	5.8	5.0	4.80	6.3

[1]Remaining ingredients were the same as batch D (Table 2), including dry bread crumbs, salt, MSG, and pepper.

[2]Italian seasoning was a mixture of marjoram, thyme, rosemary, savory, sage, oregano, and basil.

Table 4 shows the final formula, incorporating the results of both trials.

TABLE 4. FINAL FORMULA FOR FISH BITES IN TOMATO SAUCE

Ingredients	Percent
Minced fish	82.5
TSP	6.0
SPF	4.0
Bread crumbs, dry	4.0
Onions, dehydrated	1.4
Salt	1.0
MSG	0.3
Parsley, dehydrated	0.3
Oregano, leaf	0.2
Garlic, powdered	0.1
Basil, leaf	0.1
Pepper, black, ground	0.1

Procedure: Semi-thaw minced fish. Mix with remaining ingredients. Hydrate under refrigeration for at least one hour. Shape into balls, about 1/3 oz (9-10 grams) in size. Blanch in hot oil at 196°C (385°F) for 30 seconds, fill into cans (303 x 406 preferably) and fill with boiling hot tomato sauce (Table 1) in the proportion of at least 55% fish bites to 45% sauce. Close cans and process.

To evaluate the acceptability of combinations of fish and other meats, the final formula (Table 4) was used to make fish bites from fish (white sucker) (100), fish and pork (50/50), pork (100), fish and beef (50/50) and beef (100). Beef and pork were lean cuts, trimmed of as much fat as possible,

before being finely ground. Table 5 shows taste panel scores and shear values. The combination of fish and pork had the highest scores for juiciness and flavor, had nearly the highest score for overall acceptability, and seemed to have better flavor and tenderness than fish alone. The low scores for the beef and fish-beef combinations may be because the formula had been developed for an optimum fish bite and needed adjustment to make an optimum beef meatball.

TABLE 5. TASTE PANEL SCORES* AND SHEAR VALUES FOR "MEATBALLS" IN TOMATO SAUCE MADE FROM SEVERAL COMBINATIONS OF MEAT AND FISH

	Combination				
Parameters	Fish	Fish-pork	Pork	Fish-beef	Beef
Acceptability of texture	4.8	5.3	5.5	5.8	4.3
Tenderness	3.6	4.9	4.8	5.3	6.3
Juiciness	6.0	6.0	5.0	4.9	4.4
Flavor	6.0	7.3	6.9	5.4	5.1
Overall desirability	5.9	6.6	6.8	5.6	4.8
Shear values (lb/g)	2.8	2.5	3.0	3.0	3.8

* On a scale of 9 (most desirable) to 1 (least desirable); except for tenderness and juiciness, where 5 was optimum.

Although minced white sucker was used during the original development of this product, there are many other underused fish that could be substituted. For comparison, we made up fish bites from several underused species, including

whiting (Merluccius bilinearis), pollock (Pollachius virens), cod (Gadus morhua), and minced yellowtail flounder racks (Limanda ferruginae). Table 6 shows the taste panel and shear press results for five different species.

TABLE 6. TASTE PANEL SCORES* AND SHEAR VALUES FOR FISH BITES IN TOMATO SAUCE MADE FROM SEVERAL FISH SPECIES

	Fish Species				
Parameters	Sucker	Whiting	Pollock	Cod	Flounder
Acceptability of texture	5.1	5.5	4.1	5.1	5.4
Tenderness	4.5	4.5	5.4	4.0	4.9
Juiciness	4.9	6.0	4.9	5.4	5.6
Flavor	6.1	6.1	6.6	6.9	7.0
Overall desirability	6.1	6.1	6.4	6.5	7.1
Shear values (lb/g)	2.8	2.3	3.1	3.0	3.3

* On a scale of 9 (most desirable) to 1 (least desirable); except for tenderness and juiciness, where 5 was optimum.

Flounder had the highest scores for most parameters, but the other fish, although their scores differed in individual parameters, differed little in overall acceptability. Probably many fish species could produce acceptable results.

A triangle test was used to find out if the taste panel could detect a difference between canned and frozen fish bites in tomato sauce made from the same formula. As shown in Table 7, the taste panel preferred the canned product to the frozen product by 10 to 4. Flavor and tenderness were the main reasons for the preferences.

TABLE 7. TRIANGLE TEST RESULTS FOR FROZEN VS CANNED FISH BITES IN TOMATO SAUCE (Formula K)

Number of judgements	Number of "correct" decisions	Preference	
		Canned	Frozen
16	14*	10	4

*Significance--very highly significant ($P<0.01$)

Reasons for preference:

Flavor	13 judgements
Tenderness	8 judgements
Juiciness	4 judgements
Color	2 judgements
Texture	2 judgements

Table 8 shows an analysis of the product made from white sucker, using the formulas in Tables 1 (fish bites) and 4 (tomato sauce). It is high in protein, and low in fat and carbohydrates, compared to many other products of this type.

TABLE 8. PROXIMATE COMPOSITION OF FISH BITES IN TOMATO SAUCE

	Moisture	Fat	Protein	Ash	Carbohydrate*
	%	%	%	%	%
Fish bite	72.1	3.2	15.4	2.0	7.3
Tomato sauce	87.9	1.5	2.7	2.2	5.7

*Carbohydrate calculated by difference: 100%-(%moisture + %fat + %protein + %ash) = % carbohydrate.

CONCLUSIONS

In conclusion, a canned "meatball in tomato sauce" made from minced white sucker, as well as several other underutilized species of fish, was very acceptable and could be a logical addition to a line of canned convenience foods.

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